Recall that a _____ is a line, segment, or ray that passes through the midpoint of another segment; and that an _____ is a line, segment or ray that cuts an angle in half.

Part I

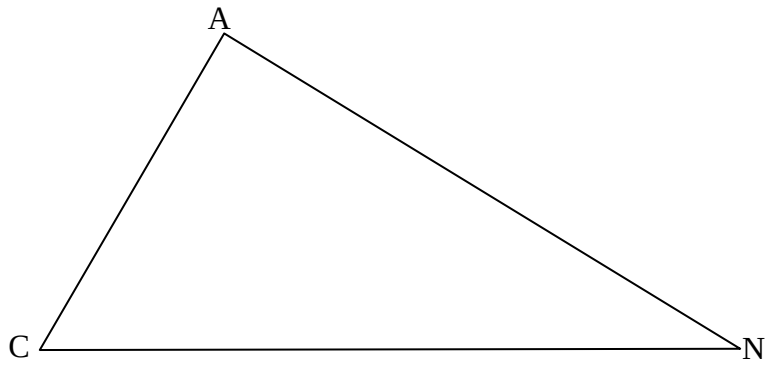
Either construct or draw the **perpendicular bisector** of every side in the triangle below.

Recall that in order to construct the perpendicular bisector using a compass, you have to:

a) Place the center of the compass on one of the endpoints of the segment
b) Open the compass anywhere that is more than half of the measure of the segment
c) Draw an arc at the top and bottom of the segment
d) Repeat on the other endpoint of the segment
e) Connect the points of intersection of both sets of arcs

Alternately, you can

1) Measure the segment in centimeters.
2) Divide by 2. That number would be where the midpoint is.
3) Place the center of the compass on the midpoint.
4) Use the 90^o indicator in your compass, and mark a point right above it.
5) Connect the midpoint and the point above the 90^o line indicator.



Now, mark a point anywhere on each of the perpendicular bisectors, and measure the distance from that point to each of the endpoints of the segment that that perpendicular bisector is bisecting. Label the distances. What do you notice? _____
_____

Now, measure the distance between the point where all the perpendicular bisectors intersect and each of the vertices of the triangle. What do you notice? _____

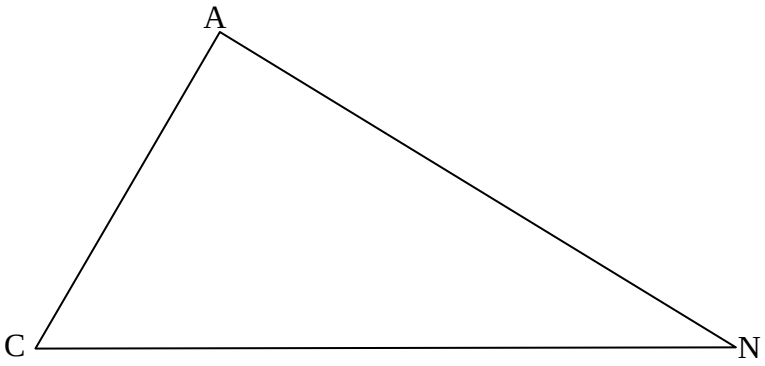
Part II

Now either construct or draw the angle bisectors of each of the angles in the triangle below.

Recall that in order to construct an angle bisector, you must

a) Place the center of the compass on the vertex of the angle.
b) Draw an arc that crosses both sides of the angle.
c) Place the center of the compass on one of the points of the arcs that crosses the side of the triangle.
d) Make an arc in the inside of the angle.
e) From the other point of intersection between the original arc and the other side of the angle, make an arc that crosses the second arc inside of the angle.
f) Connect the vertex of the angle and the point of intersection between the second and third arcs.

Alternately, you can:
1) Measure the angle using the protractor part of the compass, starting from 0.
2) Divide that number by 2, and mark a point at that measure.
3) Connect the vertex to the point that you made in step #2.



Now, mark a point anywhere on each of the angle bisectors, and measure the distance between that point and each of the sides of the angle that they intersect. Label the distance. What do you notice?
_____

Lastly, measure the distance between the point of intersection of the three angle bisectors and each side. What do you notice? _____

What you have just discovered is the **properties of perpendicular bisectors and angle bisectors in any triangle**. Those properties are:

1) Any point on the perpendicular bisector of a segment is _____ to the endpoints of the segment.
2) Any point on the angle bisector is _____ to the sides of the angle.
3) The point of concurrency of the perpendicular bisectors (the point where all the perpendicular bisectors intersect, which is called the **circumcenter**) is _____ to the vertices of the triangle.
4) The point of concurrency of the angle bisectors (called the **incenter**) is _____ to each side of the triangle.